

IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1. (currently amended) A transmission apparatus, of orthogonal frequency division multiplexing for multiplexing a plurality of carriers orthogonal to one another for transmitting signals having a transmission band, including a transmission side and a reception side, said transmission side comprising:

an input terminal, to which information ~~code~~ said signals are applied;

a first modulator coupled with said input terminal for outputting first signals which are main information code signals modulated in accordance with a first modulation scheme ~~which can be applied with a synchronous detection for demodulation in said reception side;~~

a second modulator for outputting second signals which are auxiliary signals modulated in accordance with a second modulation scheme ~~different from the modulation scheme associated with said first modulator circuit; and~~

a transmission unit including a distributing circuit coupled with said first and second modulators, said distributing circuit ~~for distributing said first and second signals modulated by said first and second modulator~~ modulators ~~circuits~~ to a plurality of predetermined carriers, respectively, wherein ~~said distributing circuit distributes said~~ so that said second signals are arranged at the positions of ~~modulated by said second modulator circuit to all or some of said carriers existing within a listed predetermined number of carriers close to columns from at least one~~

of both ~~end-ends~~regions of a ~~signal~~said transmission frequency band, and said first signals ~~modulated by said first modulator~~are arranged at the positions of all or some of to the remaining carriers other than said limited number of carriers of said transmission band, and outputting the modulated signals.

2. (currently amended) An apparatus according to claim 1, wherein said second signals are arranged at the positions of all or some of said carriers existing within a predetermined number of carriers from said respective ends ~~end regions are an end region on the lower frequency side and an end region on the higher frequency side of said transmission frequency band~~.

3. (currently amended) A transmission apparatus, of orthogonal frequency division multiplexing for multiplexing a plurality of carriers orthogonal to one another for transmitting signals, including a transmission side and a reception side, said transmission side comprising:

an input terminal to which said signals are applied;

a first modulator coupled with said input terminal for outputting first signals which are main information code signals modulated in accordance with a first modulation scheme;

a second modulator for outputting second signals which are auxiliary signals modulated in accordance with a second modulation scheme; and

a transmission unit including a distributing circuit coupled with said first and second modulators for distributing said first and second signals modulated by said

first and second modulators to a plurality of predetermined carriers, respectively, so that said second signals are arranged at the positions of all or some of said carriers existing within a limited number of carriers close to at least one of both ends of said transmission band, and said first signals are arranged at the positions of all or some of the remaining carriers other than said limited number of carriers of said transmission band, and outputting the modulated signals. ~~An apparatus according to claim 1,~~

wherein said second modulator further outputs pilot signals and said carriers distributed with said second signals modulated by said second modulator circuit are some or all of carriers except for carriers used for reproducing reference signal vectors in accordance with said pilot signals for use in demodulating modulated said first signals of carriers modulated in accordance with said first modulation scheme which can be applied with the synchronous detection.

4. (currently amended) An apparatus according to claim 3, wherein said second the modulation scheme associated with in said second modulator is a differential modulation scheme.

5. (currently amended) An apparatus according to claim 3, wherein said second the modulation scheme associated with in said second modulator is a modulation scheme ~~which can be applied with a synchronous detection having a smaller number of multilevel multilevels than a number of multilevel multilevels in the~~

~~said first modulation scheme associated with said first modulator which can be applied with the synchronous detection.~~

6. (currently amended) An apparatus according to claim 5, wherein ~~said second the modulation scheme associated with~~ said second modulator is one of QPSK, 16QAM and 32QAM schemes ~~when the modulation scheme associated with said first modulator is 64QAM.~~

7. (currently amended) A transmission apparatus of orthogonal frequency division multiplexing for transmitting ~~a signal~~ signals ~~on which a plurality of carriers are multiplexed, said carriers being orthogonal to one another~~ having a transmission band, said transmission apparatus comprising:

a first error correction coding circuit for converting a first code to a first error correction code;

a second error correction coding circuit for converting a second code to a second error correction code which has error correcting performance higher than said first error correction code;

a first modulator for outputting ~~a signal~~ first signals which are main information code signals modulated with said first error correction code in accordance with a first modulation scheme ~~which can be applied with a synchronous detection for demodulation;~~

a second modulator for outputting ~~a signal~~second signals which are auxiliary signals modulated with said second error correction code in accordance with a second predetermined modulation scheme; and

a distributing circuit for distributing the ~~signals~~said first and second signals modulated by said first and second modulator-modulators and the signal modulated by ~~said second modulator~~ to a plurality of predetermined carriers, respectively, so that said second signals distributing circuit distributing the signal modulated by said ~~second modulator~~are arranged at the positions of to all or some of said carriers existing within a limited predetermined number of carriers close to columns from at least one of both end-ends regions of said a signal transmission frequency band, and said first signals are arranged at the positions of all or some of assigning the signal modulated by ~~said first modulator~~ to the remaining carriers other than said limited number of carriers of said transmission band.

8. (currently amended) An apparatus according to claim 7, wherein said second signals are arranged at the positions of all or some of said carriers existing within a predetermined number of carriers from said respective endsend regions are an end-region on the lower frequency side and an end-region on the higher frequency side of said transmission frequency band.

9. (currently amended) A transmission apparatus of orthogonal frequency division multiplexing for transmitting signals having a transmission band, said transmission apparatus comprising:~~An apparatus according to claim 7,~~

a first error correction coding circuit for converting a first code to a first error correction code;

a second error correction coding circuit for converting a second code to a second error correction code which has error correcting performance higher than said first error correction code;

a first modulator for outputting first signals which are main information code signals modulated with said first error correction code in accordance with a first modulation scheme;

a second modulator for outputting second signals which are auxiliary signals modulated with said second error correction code in accordance with a second modulation scheme; and

a distributing circuit for distributing said first and second signals modulated by said first and second modulators, to a plurality of predetermined carriers, respectively, so that said second signals are arranged at the positions of all or some of said carriers existing within a limited number of carriers close to at least one of both ends of said transmission band, and said first signals are arranged at the positions of all or some of the remaining carriers other than said limited number of carriers of said transmission band,

wherein the said second modulator further outputs pilot signals and said carriers distributed to the said second signals signal-modulated by said second modulator are some or all of carriers except for carriers used for reproducing reference signal vectors in accordance with said pilot signals for use in demodulating

~~said information code~~ first signals of carriers modulated in accordance with said first modulation scheme.

10. (currently amended) An apparatus according to claim 79, wherein said second error correction code is a 1/2 convolutional code when said first error correction code is a 3/4 convolutional code.

11. (currently amended) A transmission/reception system₁ of orthogonal frequency division multiplexing₁ having a transmitter for transmitting a ~~signals~~ signals having a transmission band on which a plurality of carriers are multiplexed, said carriers being orthogonal to one another, and a receiver for receiving and demodulating a transmitted signal said signals,

wherein said transmitter comprises:

a first modulator for outputting a ~~code~~ first signals which are main information code signals modulated in accordance with a first modulation scheme ~~which can be applied with a synchronous detection for demodulation;~~

a second modulator for outputting a ~~code~~ second signals which are auxiliary signals modulated in accordance with a second modulation scheme ~~different from the modulation scheme associated with said first modulator; and~~

a distributing circuit for distributing the ~~code~~ said first and second signals modulated by said first and second modulator to a plurality of predetermined carriers, respectively, wherein so that said distributing circuit distributes the code modulated by said second modulator second signals are arranged at the positions of ~~to all or~~

some of carriers existing within a limited predetermined number of carriers close to
columns from at least one of both end regions ends of said a signal transmission
frequency band, and the said first signals code modulated by said first modulator are
arranged at the positions of all or some of to the remaining carriers other than said
limited number of carriers of said transmission band.

12. (currently amended) A transmission/reception system, of orthogonal
frequency division multiplexing, having a transmitter for modulating a plurality of
carriers with a plurality of signals to transmit the signals having a transmission band,
~~said carriers being orthogonal to one another, and a receiver for receiving and~~
~~demodulating a transmitted signals~~ said signals,

wherein said transmitter comprises:

a first error correction coding circuit for converting a first code to a first error
correction code;

a second error correction coding circuit for converting a second code to a
second error correction code which has error correcting performance higher than
said first error correction code;

a first modulator for outputting ~~a signal~~ first signals which are main information
code signals modulated with said first error correction code in accordance with a first
~~modulation scheme which can be applied with a synchronous detection for~~
~~demodulation;~~

a second modulator for outputting ~~a signal~~signals which are auxiliary signals modulated with said second error correction code in accordance with a second predetermined modulation scheme; and

a distributing circuit for distributing the ~~said first and second signals~~ signal modulated by said first and second ~~modulator-modulators~~ and the signal modulated by ~~said second modulator~~ to a plurality of predetermined carriers, respectively, so that said second signals are arranged at the positions of ~~distributing circuit~~ distributes the signal modulated by said second modulator to all or some of said carriers existing within a limited predetermined number of carriers close to columns from at least one of both end regionsends of said a signal transmission frequency band, and said first signals are arranged at the positions of all or some of assigning the signal modulated by said first modulator to the remaining carriers other than said limited number of carriers of said transmission band.

13. (new) An apparatus according to claim 1, wherein said first modulation scheme is a synchronous modulation scheme and said second modulation scheme is a differential modulation scheme.

14. (new) An apparatus according to claim 13, wherein said second modulation scheme is one of DBPSK, DQPSK, 8DPSK and 16DAPSK schemes.

15. (new) An apparatus according to claim 1, wherein said second modulation scheme in said second modulator is a modulation scheme having a

smaller number of multilevel than a number of multilevel in said first modulation scheme in said first modulator which can be applied with the synchronous detection.

16. (new) An apparatus according to claim 15, wherein said second modulation scheme in said second modulator is one of QPSK, 16QAM and 32QAM schemes.

17. (new) An apparatus according to claim 16, wherein said first modulation scheme in said first modulator is 64QAM.

18. (new) An apparatus according to claim 6, wherein said first modulation scheme in said first modulator is 64QAM.